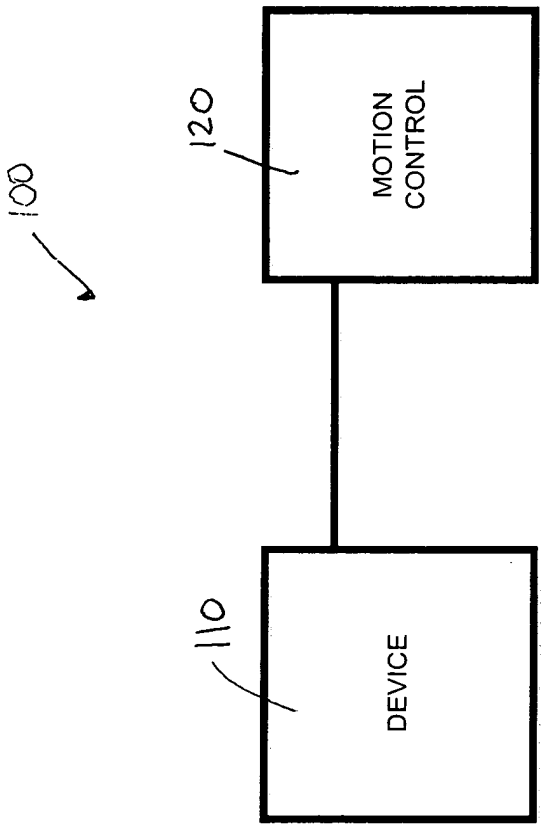


FIG. 1

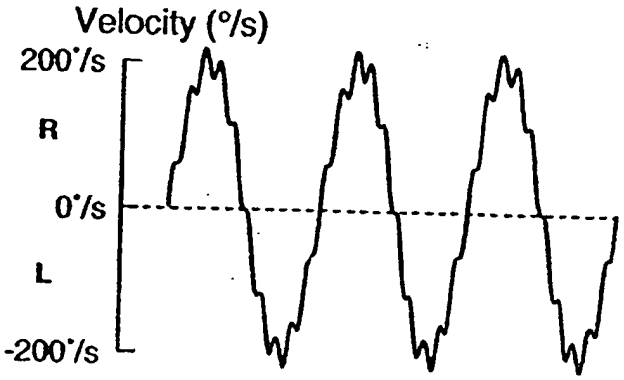


FIG. 2

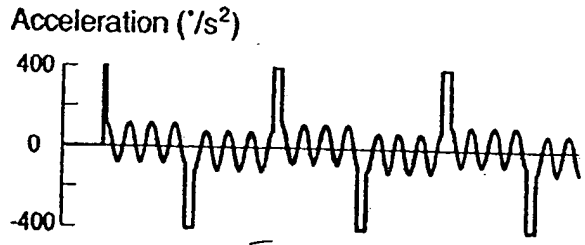


FIG. 3A

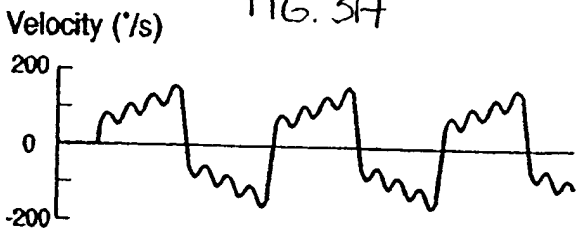


FIG. 3B

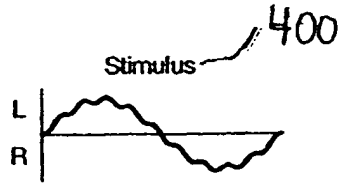


FIG. 4A

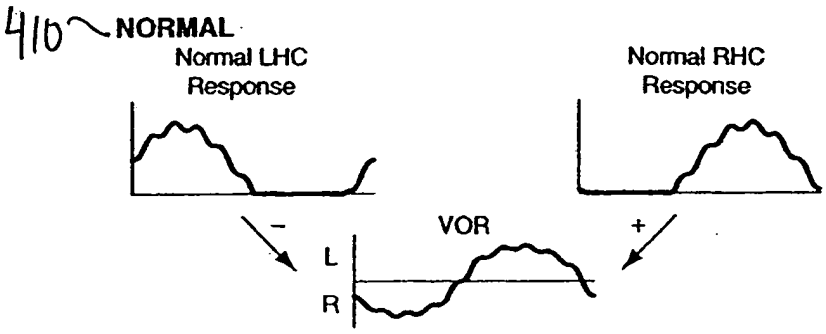


FIG. 4B

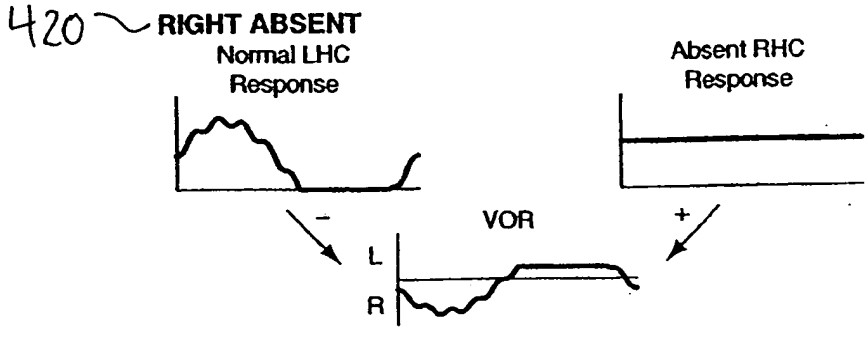


FIG. 4C

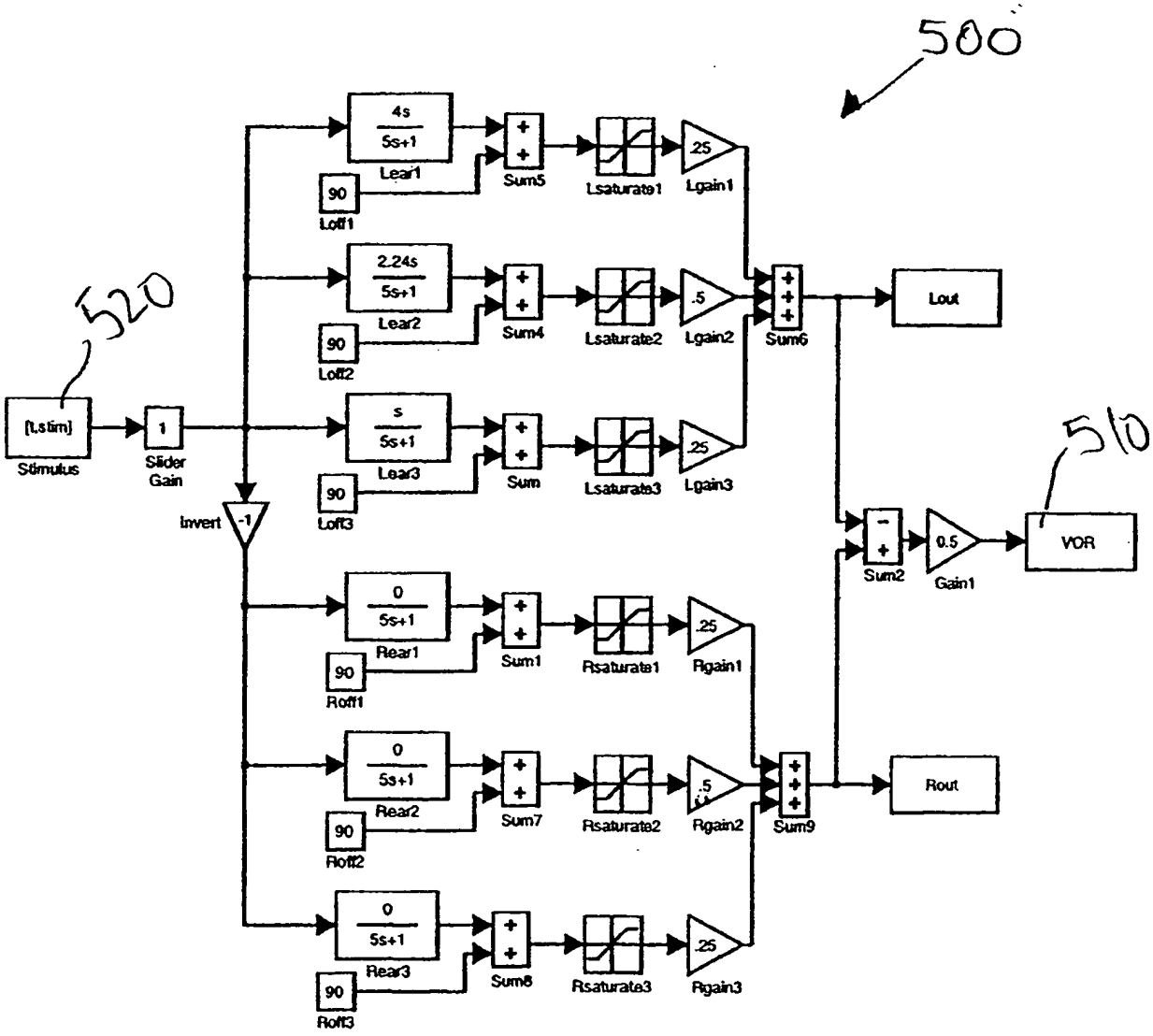
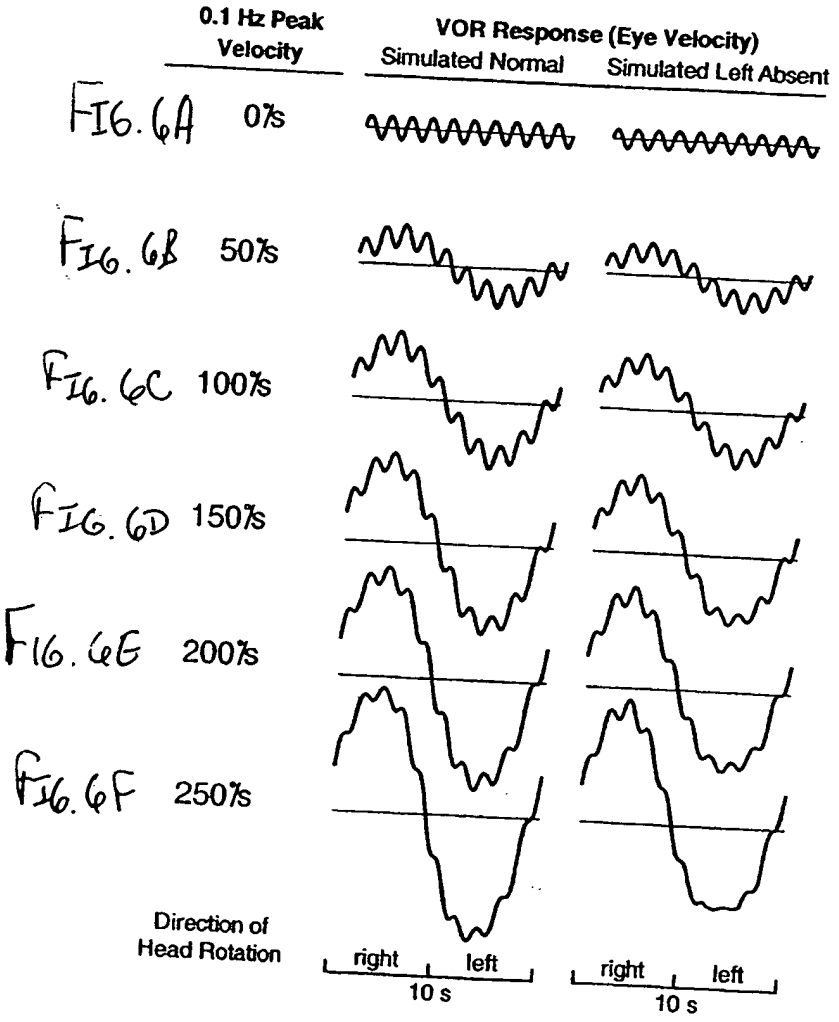
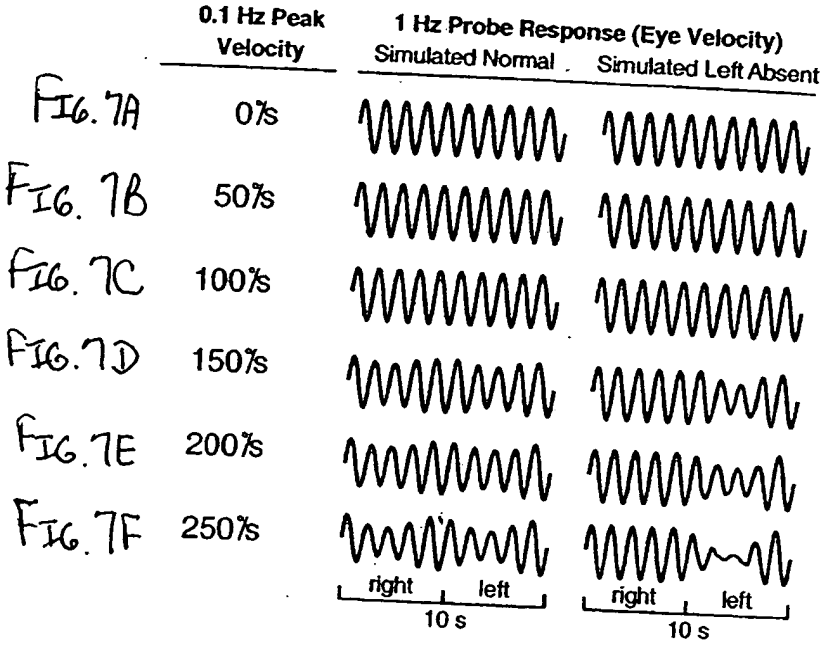
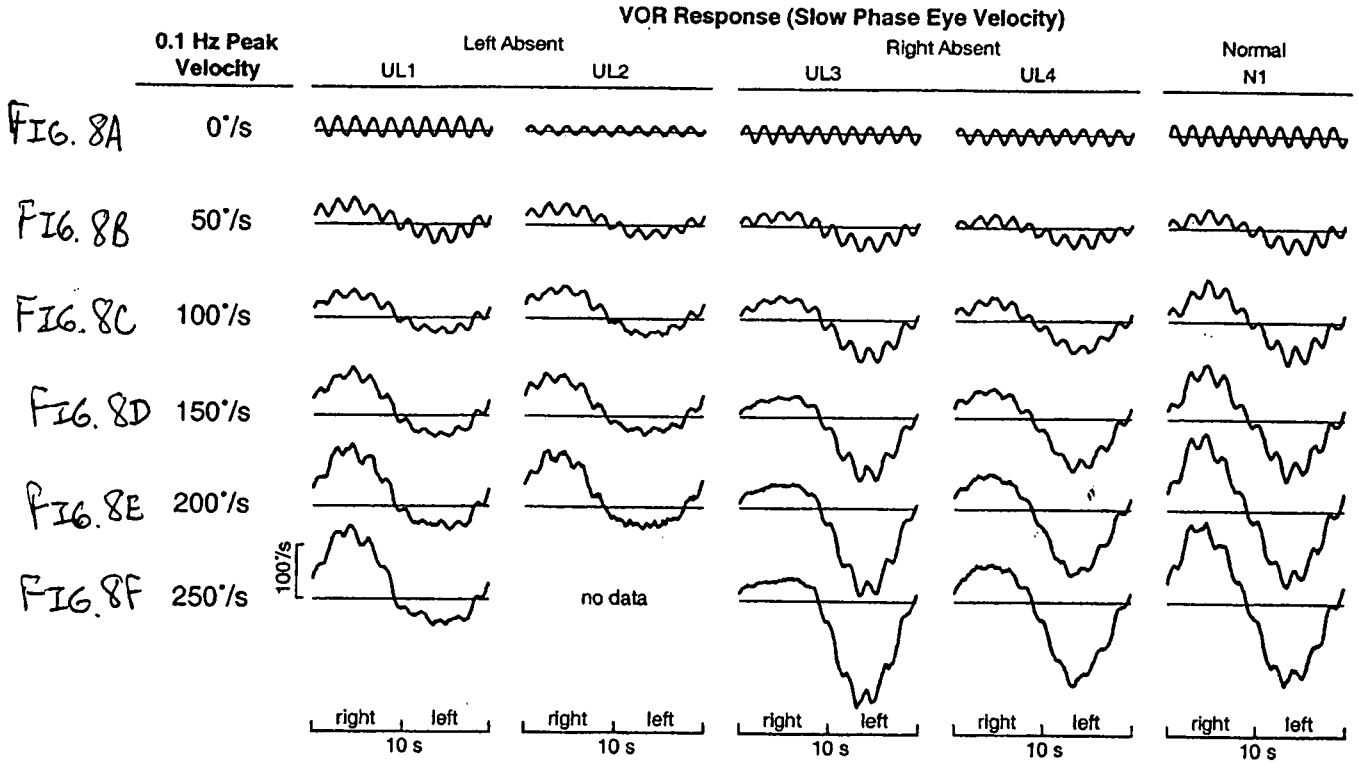
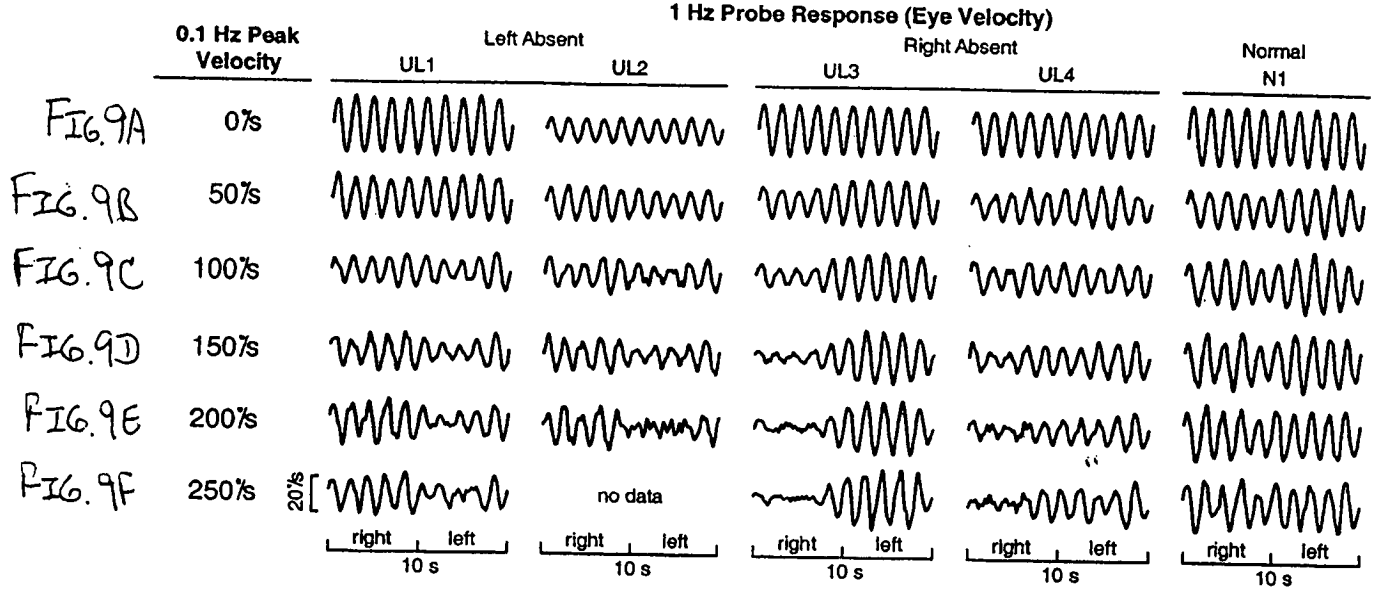

500
520
[Lstim]
Stimulus
1
Slider Gain
Invert
-1
4s / 5s+1
Lear1
90
Loff1
Sum5
Lsaturate1
.25
Lgain1
2.24s / 5s+1
Lear2
90
Loff2
Sum4
Lsaturate2
.5
Lgain2
s / 5s+1
Lear3
90
Loff3
Sum
Lsaturate3
.25
Lgain3
Sum6
Lout
510
Sum2
0.5
Gain1
VOR
0 / 5s+1
Rear1
90
Roff1
Sum1
Rsaturate1
.25
Rgain1
0 / 5s+1
Rear2
90
Roff2
Sum7
Rsaturate2
.5
Rgain2
Sum9
Rout
0 / 5s+1
Rear3
90
Roff3
Sum8
Rsaturate3
.25
Rgain3

FIG. 5


0.1 Hz Peak Velocity
VOR Response (Eye Velocity)
Simulated Normal
Simulated Left Absent
FIG. 6A 0°/s
FIG. 6B 50°/s
FIG. 6C 100°/s
FIG. 6D 150°/s
FIG. 6E 200°/s
FIG. 6F 250°/s
Direction of Head Rotation
right
left
10 s
right
left
10 s


0.1 Hz Peak Velocity
1 Hz Probe Response (Eye Velocity)
Simulated Normal
Simulated Left Absent
FIG. 7A
0°/s
FIG. 7B
50°/s
FIG. 7C
100°/s
FIG. 7D
150°/s
FIG. 7E
200°/s
FIG. 7F
250°/s
right
left
10 s
right
left
10 s


VOR Response (Slow Phase Eye Velocity)
0.1 Hz Peak Velocity
Left Absent
UL1
UL2
Right Absent
UL3
UL4
Normal
N1
FIG. 8A
0°/s
FIG. 8B
50°/s
FIG. 8C
100°/s
FIG. 8D
150°/s
FIG. 8E
200°/s
FIG. 8F
250°/s
100°/s
no data
right
left
10 s


1 Hz Probe Response (Eye Velocity)
0.1 Hz Peak Velocity
Left Absent
UL1
UL2
Right Absent
UL3
UL4
Normal
N1
FIG. 9A
0°/s
FIG. 9B
50°/s
FIG. 9C
100°/s
FIG. 9D
150°/s
FIG. 9E
200°/s
FIG. 9F
250°/s
20°/s
no data
right
left
10 s

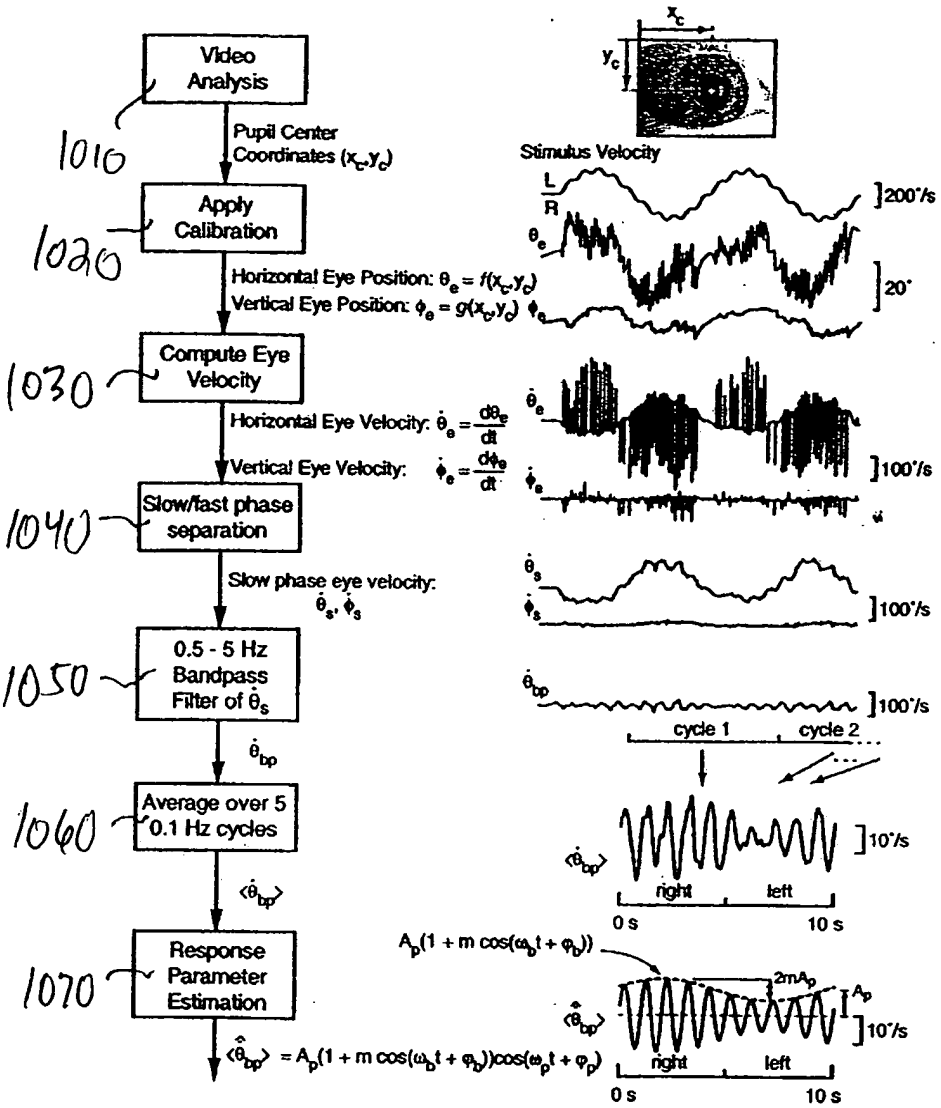


FIG. 10A

FIG. 10B

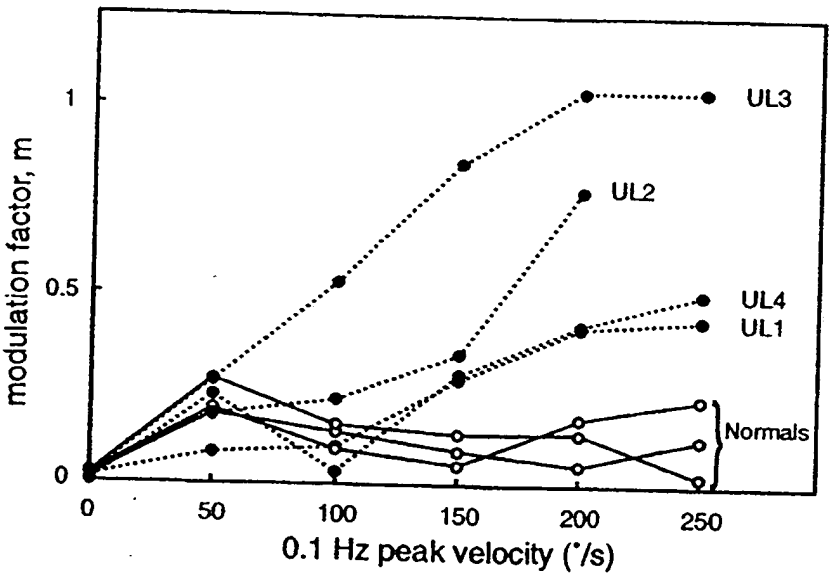

modulation factor, m
1
0.5
0
0
50
100
150
200
250
0.1 Hz peak velocity (°/s)
UL3
UL2
UL4
UL1
Normals

FIG. 11

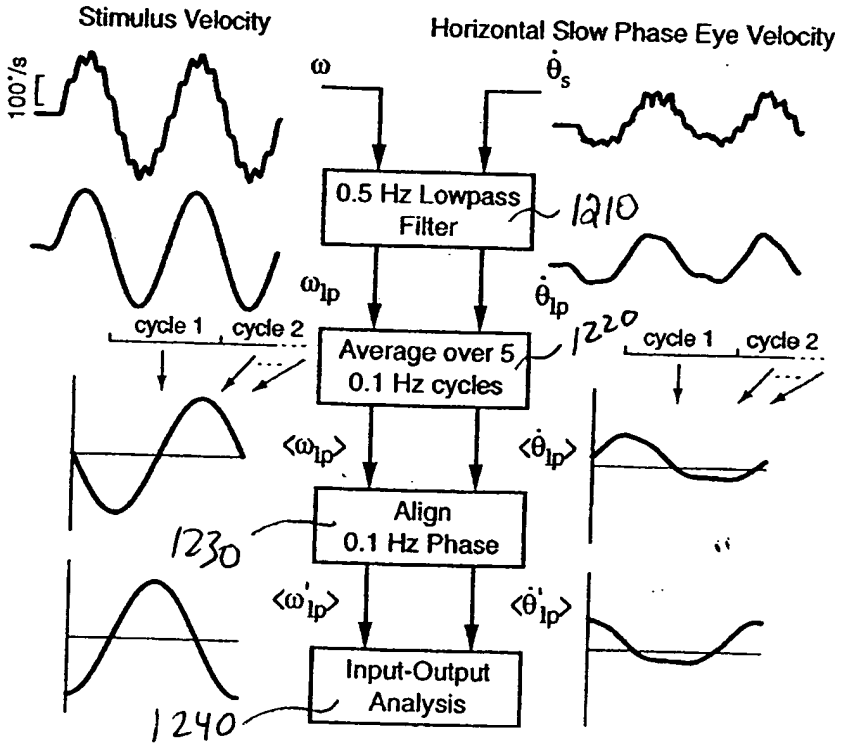

Stimulus Velocity
Horizontal Slow Phase Eye Velocity
100°/s
ω
$\dot{\theta}_s$
0.5 Hz Lowpass Filter
1210
ω_{lp}
$\dot{\theta}_{lp}$
cycle 1
cycle 2
Average over 5 0.1 Hz cycles
1220
cycle 1
cycle 2
$\langle\omega_{lp}\rangle$
$\langle\dot{\theta}_{lp}\rangle$
Align 0.1 Hz Phase
1230
$\langle\omega'_{lp}\rangle$
$\langle\dot{\theta}'_{lp}\rangle$
Input-Output Analysis
1240

FIG. 12

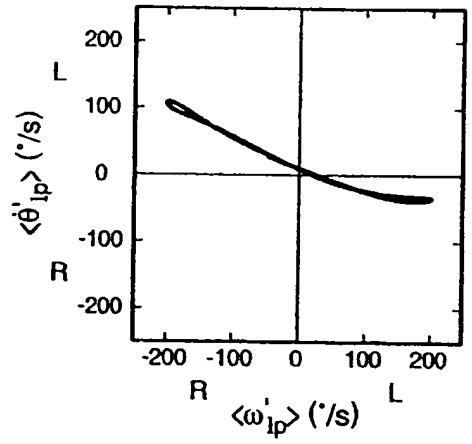

200
L
100
0
-100
R
-200
$\langle\dot{\theta}'_{lp}\rangle$ (°/s)
-200 -100 0 100 200
R
L
$\langle\omega'_{lp}\rangle$ (°/s)

FIG. 13

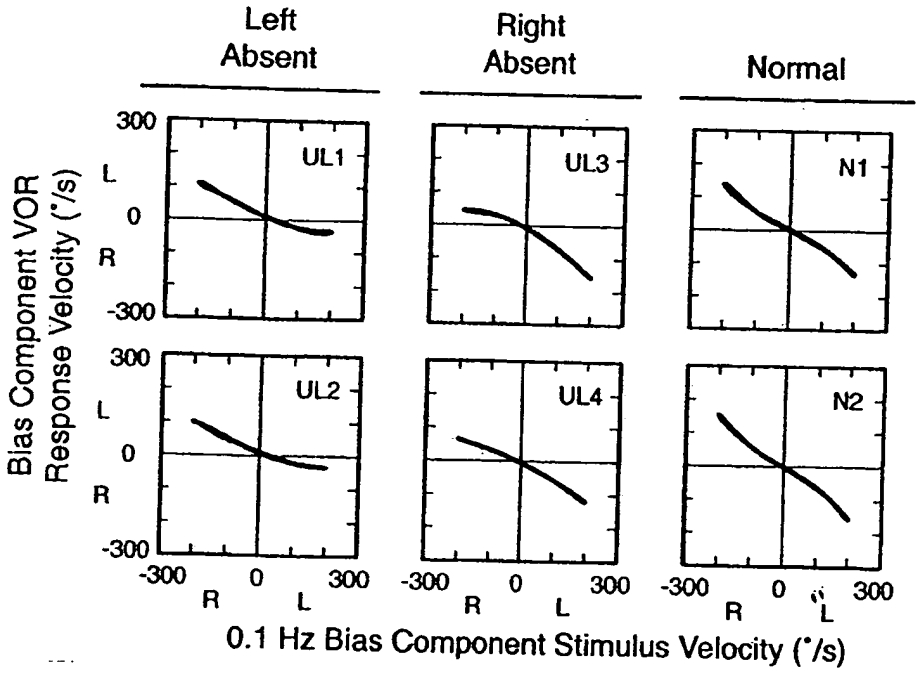

Left
Absent
Right
Absent
Normal
UL1
UL3
N1
UL2
UL4
N2
300
L
0
R
-300
-300
0
300
R
L
Bias Component VOR
Response Velocity (°/s)
0.1 Hz Bias Component Stimulus Velocity (°/s)

FIG. 14

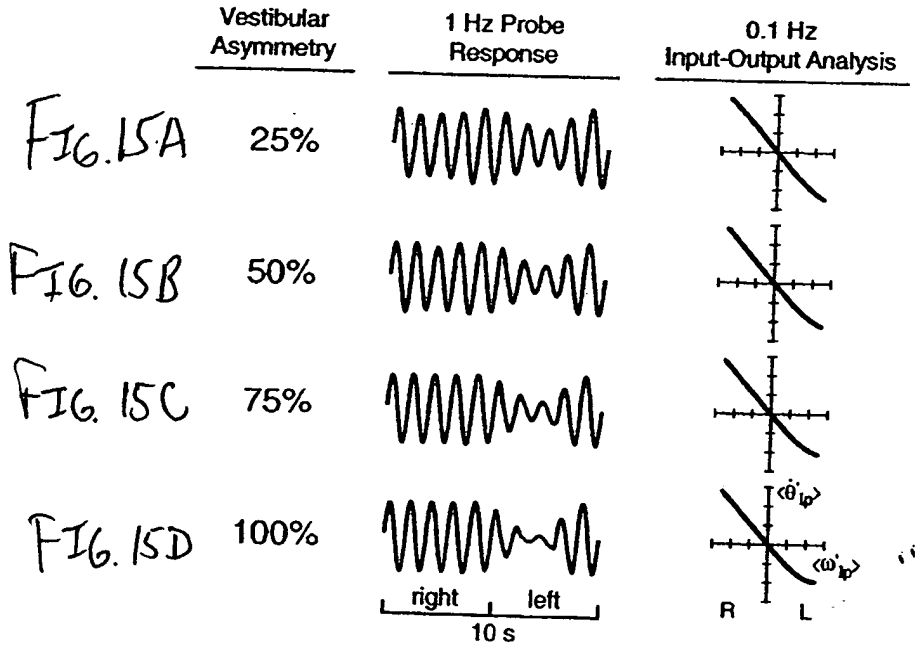

Vestibular Asymmetry
1 Hz Probe Response
0.1 Hz Input-Output Analysis
FIG. 15A
25%
FIG. 15B
50%
FIG. 15C
75%
FIG. 15D
100%
right
left
10 s
R
L

FIG. 16A

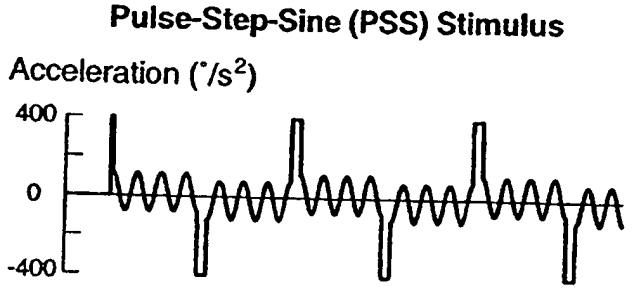


FIG. 16B

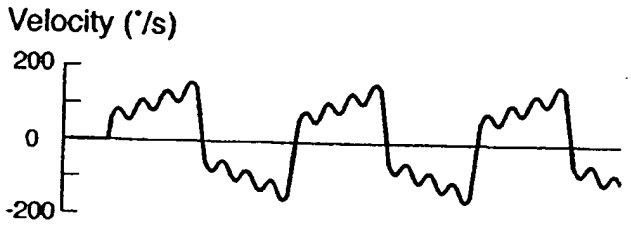
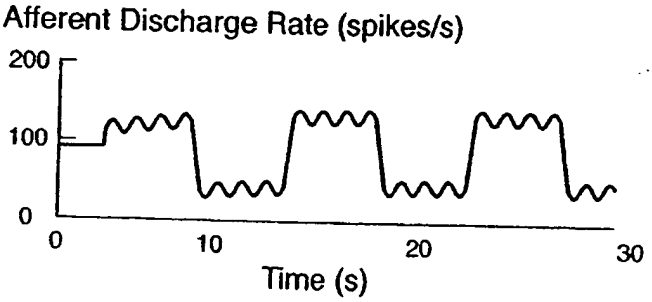
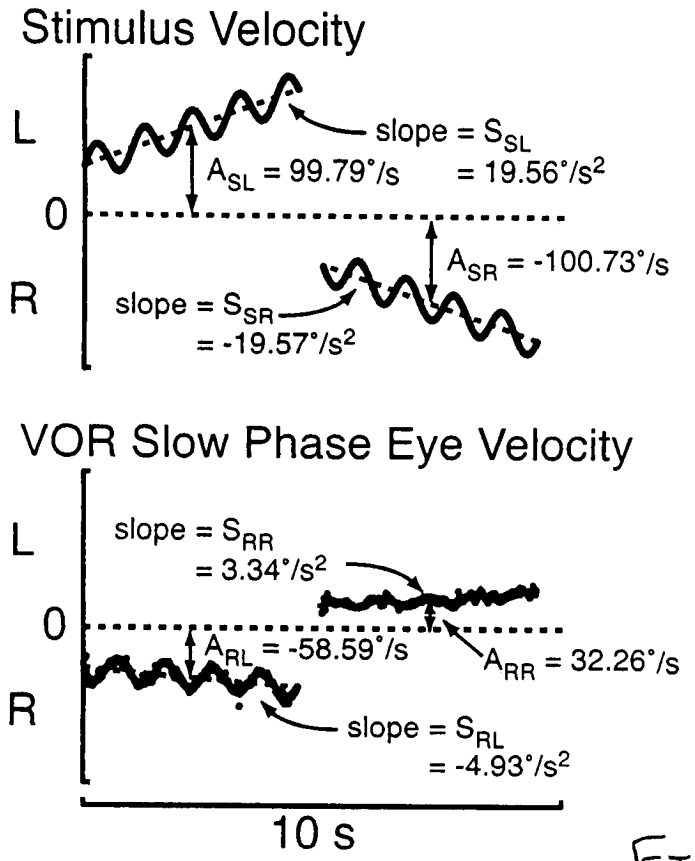


FIG. 16C



Step Component Measures



$$\text{Step Asymmetry} = \frac{\frac{A_{RL}}{A_{SL}} - \frac{A_{RR}}{A_{SR}}}{\frac{A_{RL}}{A_{SL}} + \frac{A_{RR}}{A_{SR}}} \times 100$$

(+) sign = decreased response to rightward rotation

(−) sign = decreased response to leftward rotation

Mean Response Slope = $(S_{RR} - S_{RL})/2$

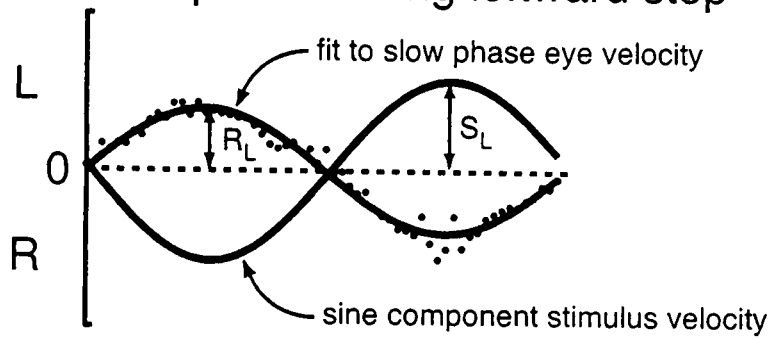
Mean slope is related to the VOR time constant.

Slope > 0: time constant > 5s
Slope = 0: time constant = 5s
Slope < 0: time constant < 5s

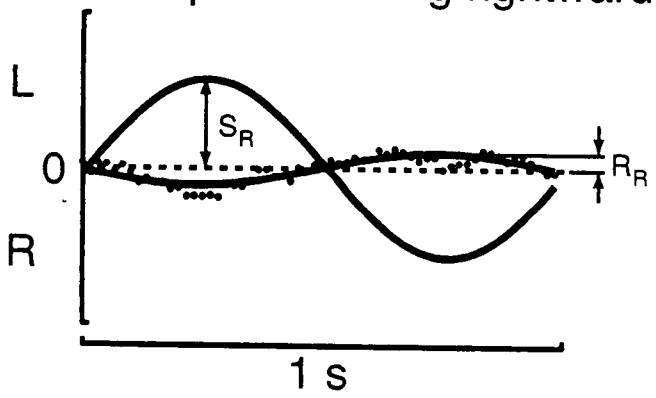
FIG. 17A

Sine Component Measures

Sine response during leftward step



Sine response during rightward step



Sine component gain during leftward step

$$VOR_L = \frac{R_L}{S_L}$$

Sine component gain during rightward step

$$VOR_R = \frac{R_R}{S_R}$$

Sine component gain asymmetry

$$= \frac{VOR_L - VOR_R}{VOR_L + VOR_R} \times 100$$

(+) sign = decreased response to rightward rotation

(−) sign = decreased response to leftward rotation

FIG. 17B

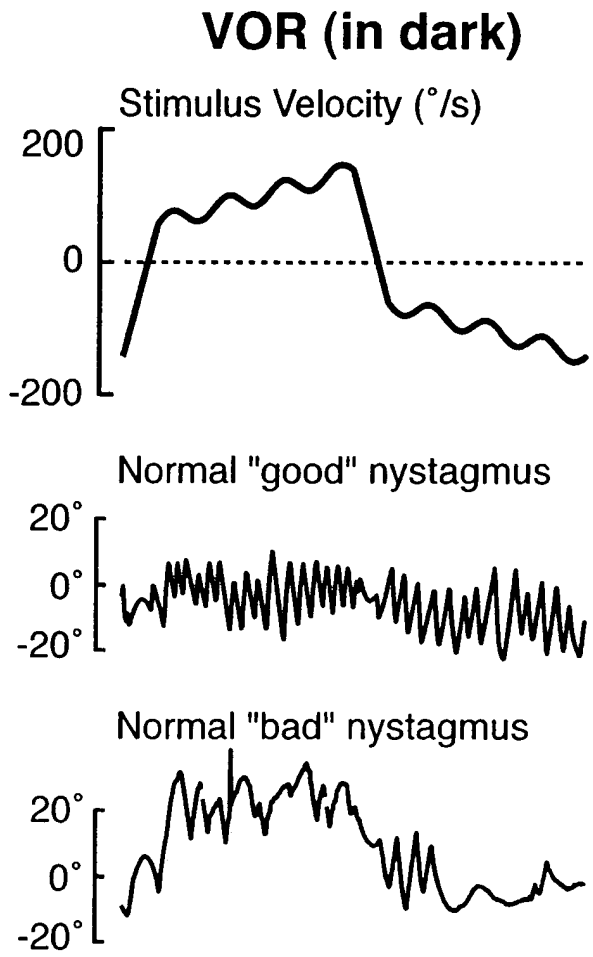


FIG. 18A

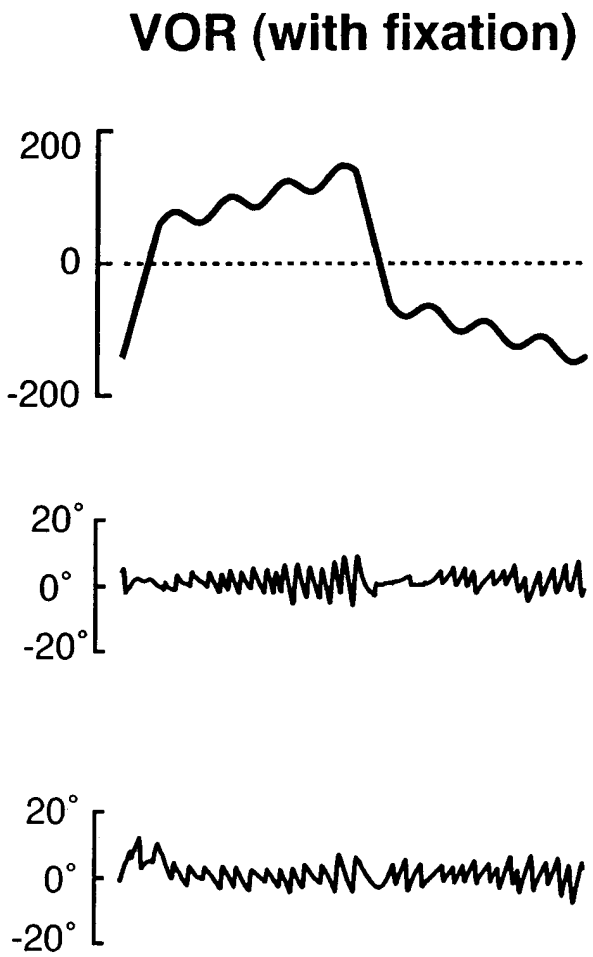


FIG. 18B

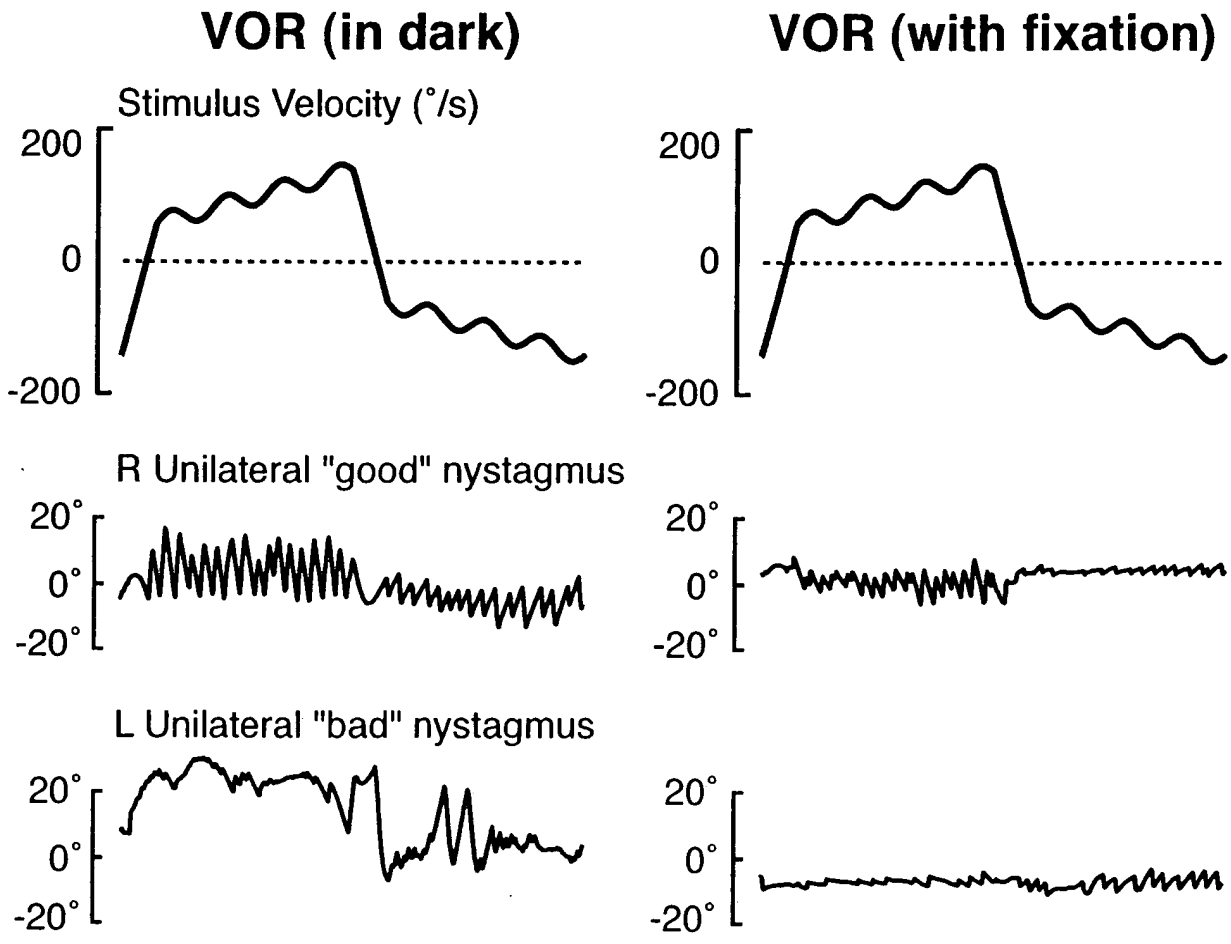


FIG. 19A

FIG. 19B

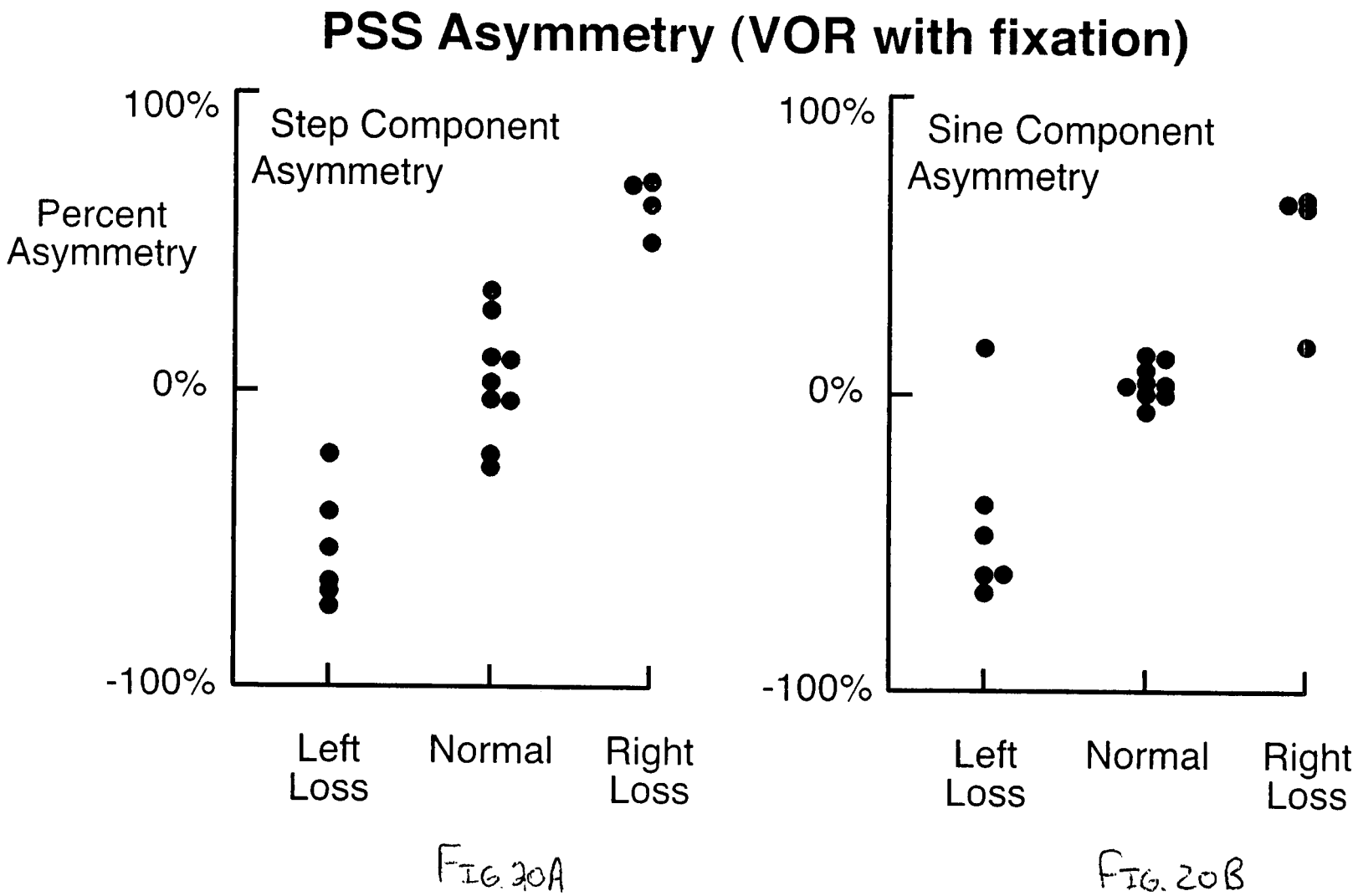


FIG. 20A

FIG. 20B